

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER

163-344

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/914143

INTERNATIONAL APPLICATION NO.

PCT/EP00/02045

INTERNATIONAL FILING DATE

8 March 1999

PRIORITY DATE CLAIMED

10 March 1999

TITLE OF INVENTION

Equipment for detecting that a target has received a direct hit from a simulated weapon

APPLICANT(S) FOR DO/EO/US

Ambrosoli Franco and Porzio Massimo

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
- a. ☒ is attached hereto (required only if not communicated by the International Bureau).
- b. ☐ has been communicated by the International Bureau.
- c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
- a. ☐ is attached hereto.
- b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
- a. ☐ are attached hereto (required only if not communicated by the International Bureau).
- b. ☐ have been communicated by the International Bureau.
- c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
- d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98. With PTO 1449 and cited references
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A **FIRST** preliminary amendment.
14. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information: Copy of Form PCT/IPEA/416 International Preliminary Examination Report with Form PCT/IPEA/409; International Search Report; Copy of PCT Request; and Copy of PCT/IB/308

U.S. APPLICATION NO. of known case 37 CFR 1.101

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INTERNATIONAL APPLICATION NO.
PCT/EP00/02045ATTORNEY'S DOCKET NUMBER
163-34421. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):**

Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO. \$1000.00

International preliminary examination fee (37 CFR 1.482) not paid to
USPTO but International Search Report prepared by the EPO or JPO \$860.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO
but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO
but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO
and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =**CALCULATIONS PTO USE ONLY**

\$ 860.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	14 - 20 =		x \$18.00
Independent claims	1 - 3 =		x \$80.00
MULTIPLE DEPENDENT CLAIM(S) (if applicable) 0			+ \$270.00
TOTAL OF ABOVE CALCULATIONS =			\$ 860.00
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.			+ \$ 430.00
SUBTOTAL =			\$ 430.00
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).			\$
TOTAL NATIONAL FEE =			\$
Fees for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +			\$ 40.00
TOTAL FEES ENCLOSED =			\$ 470.00
			Amount to be refunded: \$
			charged: \$

\$

\$ 0

\$ 0

\$ 0

\$ 860.00

\$ 430.00

\$ 430.00

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\$ 40.00

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Amount to be
refunded: \$

charged: \$

a. ☒ A check in the amount of \$ 470.00 to cover the above fees is enclosed.b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-1540. A duplicate copy of this sheet is enclosed.d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.**

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212-302-8989

SIGNATURE

JAMES V. COSTIGAN

NAME

25,669

REGISTRATION NUMBER

"Equipment for detecting that a target has received a direct hit from a simulated weapon".

The present invention refers to equipment for detecting that a target has received a direct hit
5 from a simulated weapon.

In the field of harmless weapons which, in turn, can be divided into toy war guns, hunting firearms and rifle range weapons, there are the so-called electric, gas, spring-loaded and compressed air
10 types.

Electric weapons are powered by an electric motor which drives three gears in turn acting on a piston. Power supply is through a rechargeable battery. Gas weapons are powered by gas from a
15 cylinder, spring-loaded weapons function thanks to a loaded spring ejecting the projectile. Lastly the compressed air types are powered by compressed CO₂.

In general, all these weapons fire a projectile consisting of a 6 mm calibre plastic pellet. In
20 addition, other projectile types exist, comprising of measured amounts of dye which strikes the target, thus confirming a direct hit thereof. However all of these require that the weapon, whatever type, must shoot a projectile which could
25 potentially endanger users.

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In addition, the part which is hit by the dye must be replaced or cleaned thus causing certain drawbacks.

Furthermore, with plastic projectiles, it is not
5 always possible to ascertain with certainty, whether or not the target has been hit. The general object of the present invention is to solve the abovementioned problem associated with the state of the art in an extremely simple, low-cost and highly
10 practical manner.

Another object is to eliminate any chance of danger and avoid the need to replace or clean target parts which have been hit.

Another object is to assert that the shot has hit
15 the target. $\left[< 2a > \right]$

In view of the abovementioned objects, according to the present invention, it was decided to design equipment for detecting that a target has received a direct hit from a simulated weapon, possessing
20 the features explained in greater detail in the enclosed claims. The design and practical features of the present invention, and its advantages compared to the known technique, will be made even clearer and apparent by the following description,
25 referring to the enclosed drawings, which

2a

5 <WO-A-99/10700 relates to a firearm target system including a training firearm that emits laser signal in response to a mechanical wave generated from pulling the trigger of the firearm.

EP-A-0 232 157 refers to an equipment for detecting that a target has received a direct hit from a simulated weapon according to the preamble of claim 1.

10 US-A-4 487 583 describes a receiver garment for weapons engagement simulation system, wherein said garment carries a plurality of photosensitive detectors.

US-A-5 344 320 discloses a dual mode apparatus for assisting in the aiming of a firearm including laser apparatus.>

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illustrate examples of equipment made according to the invention. In the drawings:

- 5 - figure 1 shows a pistol constituting the first part of equipment used in an embodiment of the invention;
- figure 2 shows a second part of equipment applied to the front of a person for use with the pistol in figure 1;
- 10 - figure 3 shows the second part of equipment applied to the rear of a person for use with the pistol in figure 1;
- figure 4 shows a rifle constituting the first part of equipment used in the second embodiment of the invention;
- 15 - figure 5 shows the second part of equipment applied to an animal for use with the rifle in figure 4;
- figure 6 shows a rifle range target equipped with sensors according to the invention;
- 20 - figure 7 shows a controller to be used with equipment of the abovementioned type;

With reference to the Figures, equipment is proposed for detecting that a target has received a direct hit from a simulated weapon.

25 Figures 1-3 show a first embodiment in which the

equipment consists of a firearm, namely a pistol 10 and a target, namely a jacket 11 and a helmet 12 worn by an individual 13.

The pistol 10 has a coded laser emitter 14 situated on the pistol barrel, connected to a switch 15 for its activation and another switch 16 situated on the pistol handle.

A magazine 17, upon insertion into the pistol 10, turns on switch 16 on the handle. A trigger 18, when pulled, fires the pistol, brought about by the laser emitter 14.

The individual 13 carries a circuit box 22 attached to a belt 24 which is connected, by wire 23, to the pistol 10, the same wire 23 enters the underside of the handle. In addition, the jacket 11 and helmet 12 are fitted with sensors 19 and 20 interconnected by another wire 21, situated on the back of the individual 13.

The circuit box 22 also contains a battery and an acoustic signaller.

Figures 4 and 5 show a second embodiment of the invention equipment, in which a rifle 30 is used as the weapon, containing a laser emitter 29. The rifle 30 is fitted with sights 31 on a slide 32, in turn located on a control box 33, containing the

laser control electronic circuit, in turn,
positioned on an additional slide. The box 33 and
the relative circuit are connected, by a wire 34,
to a battery pack, not shown, carried by the
5 individual user. Only the circuit box 33 could also
be carried by the user.

The rifle 30 also has a switch 35 which activates a
trigger 36 of the laser emitter. A magazine 40 may
be inserted into the rifle 30 near the trigger.

10 An animal 37, for example a deer, is covered with a
vest or jacket 38 fitted with sensors 38a and a box
39 which contains a receiving circuit.

In the two examples shown, the receiving unit is
positioned differently which is positioned
15 respectively in the first instance (figures 1-3) in
box 22 and in the second instance (figures 4-5) in
box 39 which sends it to a computer (not shown),
possibly connected in turn to the person with the
rifle 30, so as to allow the detection of a direct
20 hit or not.

A similar arrangement to the second is that which
may also be used in rifle range equipment which
envisages a fixed target 45 (figure 6) and a weapon
used by the shooter, namely those shown in figures
25 1 and 4, both connected to a computer and supplied

with signalling devices.

The target 45 may contain sensors 41, 42, 43, 44) at the various zones marked by concentric rings. Naturally, real weapons may also be used with blank
5 rounds or plastic pellets.

As regards the production of a device or electronic control circuit of the equipment, figure 7 shows one possible example by way of a block diagram denoted, as a whole, by 50.

10 The device 50 is built around an RISC technology microcontroller (56), which performs the vast majority of the functions required by the specific application.

Power supply is provided by a pack of four 1.5 V
15 batteries, or five rechargeable 1.2 V batteries. Note that the maximum electrical input when firing volleys is 83 mA, whereas it is 7.7 mA with weapon 10 or 30 at rest with a backup magazine 17 or 40 in the barrel. Such values permit a battery operating
20 range with 500 mA/h batteries of between six to eleven hours of activity considering weapon usage of respectively 100% and 50% of the activity time. Obviously batteries with greater capacities will result in proportionately increased operating
25 ranges.

The sensors 19, 20 and 38a of hit detection are, according to the invention, made of photovoltaic cells. Preference for these photovoltaic cells over ordinary photocells has allowed a reduction in sensor thickness which are fitted in the "bulletproof vest" 11, on the helmet 12 or the vest 38.

The photovoltaic cell responds, without any attenuation, to incident beams even with angulations well outside what is normal to the plane of the same sensors. More expensive new generation photovoltaic cells, which are readily available on the market and made from flexible materials, make the sensors less sensitive to knocks.

To increase the reaction to random light signals common to all photovoltaic units, the same units could be counter-series connected. This greatly decreases the reduction in reception sensitivity caused by electrical discharge light sources, namely neon and mercury-discharge lamps. To curb this effect, a red film (not shown) is applied to the surface of the sensor and acts as an optic filter which cuts out the emissions in the upper band of the luminous spectrum.

Such an arrangement solves the problem connected with the use of photocells which would have required the use of lenticular optic units, with a focus of no less than 5 cm, to cover the discrete
5 areas of detection.

Besides, the presence and use of optic collimation units of the light bands would have made the reception system directive.

In support of the microcontroller 56 for that
10 concerning the processing of the signal detected by the optic sensors 19, 20, 38a an amplification and filtering chain has been included to eliminate random components from the optic signal and to bring the signal to a level which is compatible
15 with the same microcontroller.

The sensor signal passes into an attenuator circuit 51 which, by raising the input impedance, acts as a limiter for input into a subsequent amplifier 54 which is integrated upstream and downstream by
20 high-pass filters 52. Due to the high gain of the input amplifier 54, a low-pass filter 53 is placed on the power supply to lessen and make insignificant any sound produced by the microcontroller 56.

25 The output of the amplifier 54 is clipped and made

compatible with the microcontroller 56 by a Schmitt trigger 55 which, with a 1% opening of the input voltage, removes any possible background noise from the signal. A following additional low-pass filter 53 removes all the possible high frequency components which could interfere with the functioning of the microcontroller 56.

The microcontroller 56 picks up the signal coming from the sensors 19, 20 and 38a and emits a message
10 based on the decoded signal.

In fact, there is an indicator 59 of a player's "death", for example a flashing red light. Another signal 60 indicates if the weapon is unloaded and another signaller 58 shows the presence of 15 magazines in a weapon that is activated.

When the magazine 17, 40 is released or the
signaller 59, indicating the player's "death", is
activated the microcontroller 56 makes it
impossible for any further shots to be fired.

20 The shot is represented by a coded signal lasting approximately 50 m/s which can be emitted singly or repeatedly, at a rate of ten signals per second, depending on a manual or automatic weapon dial 57 (repeater shots or machine gun). The emitted shot
25 signal controls a laser diode with radiation at

the lower end of the frequency spectrum making up visible light (red colour at 670 nm; max. power 5mW).

When the magazine 17, 40 in the barrel runs out of
5 shots, the microcontroller 56 prevents their emission and activates a signaller 60 which flashes green for an eighth of a second every second.

To replace the magazine 17, 40 it must be disconnected from the weapon 10, 30 until the
10 flashing green signaller 60 stops flashing.

In addition, the microcontroller 56 emits two signals for a generator of sound effects which reproduces differentiated sounds for when shots are fired and when a player is hit. Quartz was
15 appropriately chosen as the base time reference of microcontroller 56, since the coding signals emitted (shots) and the decoding system of the signals received do not require any setting procedure.

20 To use the first weapon 10 with individuals equipped with jacket 11 and helmet 12, the users 13 must wear mirrored protective glasses to avoid the laser emission striking the pupils. This would cause irreparable damage to the retina.

25 The shot is a single modulated laser emission so

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as to avoid the random effect of external light sources.

The object mentioned in the preamble of the description is thus achieved in this way.

5 ~~Naturally, the embodiments can differ from those~~
shown solely for illustrative and unrestricted
purposes in the designs. In fact, the embodiment
relating to a rifle range weapon has been described
~~like any other form.~~

10 The invention is likewise applicable to real
weapons loaded with blank rounds, where two
adversaries fight each other, or in hunting which,
with the use of the system according to the
invention, could be called "fair hunting" since it
15 is indeed without bloodshed.

It would be sufficient to fit the chosen animal
with a photovoltaic sensor.

The scope of protection of the invention is
therefore defined by the claims enclosed.

AMENDED SHEET

CLAIMS

1. Equipment for detecting that a target has received a
5 direct hit from a simulated weapon including a weapon (10,
30) and a target (11, 12, 38, 45),
- said weapon (10, 30) providing an emitter of signals or
laser shots (14, 33) operated by a switch (16, 35) and a
trigger (18, 36)
 - 10 - said target including sensors (19, 20, 38a, 41-44) affixed
to a supporting element (12, 11, 38, 45),
 - at least said sensors being operatively connected to an
electronic detection circuit of a signal or laser shot
received by said sensors,
 - 15 - said supporting elements being worn by an user and/or
animal,
 - said emitter of signals or laser shots (14, 33) being
situated on the barrel of a pistol (10) and/or rifle (30),
said equipment comprising a control device or control
20 electronic circuit. (50) **characterised in that:**
 - said control device is built around an RISC technology
microcontroller (56) with the provision of power supply,
 - a direct hit indicator (59), a signaller (60) for
indicating whether said weapon is unloaded, and a
25 signaller (58) for detecting the presence of magazines
(17, 40) in said weapon are connected to said

microcontroller (56), wherein said microcontroller (56) prevents said weapon from being fired when said indicator (59) is on.

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CLAIMS:

1) ~~Equipment for detecting that a target has~~
received a direct hit from a simulated weapon
5 including a weapon (10, 30) and a target (11, 12,
38, 45) and characterised in that said weapon
(10,30) provides an emitter of signals or laser
shots (14, 33) operated by a switch (16, 35) and a
trigger (18, 36), and in that said target includes
10 sensors (19, 20, 38a 41-44) affixed to a supporting
element (12, 11, 38, 45), at least said sensors
being operatively connected to an electronic
detection circuit of a signal or laser shot
~~received by said sensors.~~

15 2) Equipment according to claim 1, characterised in
that said sensors (19, 20, 38a, 41-44) are
photovoltaic sensors.

3) Equipment according to claim 1, characterised in
that said supporting elements are a jacket (11) and
20 a helmet (12).

~~4) Equipment according to claim 1, characterised in~~
that said supporting elements are a vest (38) worn
~~by the user and/or animal.~~

4/ 5) Equipment according to claim 1, characterised in
that said supporting elements are ^{directly} comprised of a

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target (45).

⁵8) Equipment according to claim 1, characterised in that said weapon is a pistol (10).

⁶7) Equipment according to claim 1, characterised in that said weapon is a rifle (30).

~~8) Equipment according to claim 1, characterised in that said emitter of signals or laser shots (14, 33) is situated on the barrel of a pistol (10) and/or rifle (30).~~

10 9) Equipment according to claim 1, characterised in that it envisages a control device or control electronic circuit of said equipment (50) built around an RISC technology microcontroller (56) with ~~the provision of power supply.~~

15 ⁷10) Equipment according to claim ¹8, characterised in that in support of said microcontroller (56), for that concerning the processing of a signal detected by said sensors (19, 20, 38a) is provided an amplification and filtering chain to eliminate
20 random components from said signal and make said signal compatible with said microcontroller (56).

⁸11) Equipment according to claim ⁷10, characterised in that said chain includes an attenuator circuit (51) fitted upstream an amplifier (54), which is
25 integrated upstream and downstream by high-pass

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filters (52), there also being provided a low-pass filter (53) on a power supply, an output of said amplifier (54) is clipped and made compatible with said microcontroller (56) by a Schmitt trigger (55) which, with a 1% opening of the voltage, there being an additional low-pass filter (53), removes all the possible high frequency components which could interfere with the functioning of said microcontroller 56.

10 ~~12) Equipment according to claim 11, characterised in that to said microcontroller (56) are connected a direct hit indicator (59), a signaller (60) which indicates whether said weapon is unloaded, and a signaller (58) which detects the presence of~~
15 ~~magazines (17, 40) in said weapon.~~

13) Equipment according to claim 12, characterised in that with said magazines (17, 40) disconnected or with said indicator (59) on, said microcontroller (56) prevents the said weapon from
20 ~~being fired.~~

~~14) Equipment according to claim 11, characterised in that to said microcontroller (56) is connected a generator of differentiated sound effects.~~

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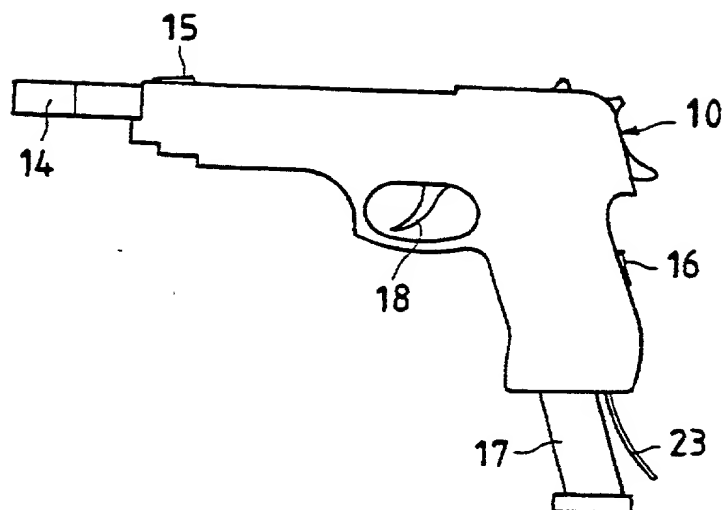
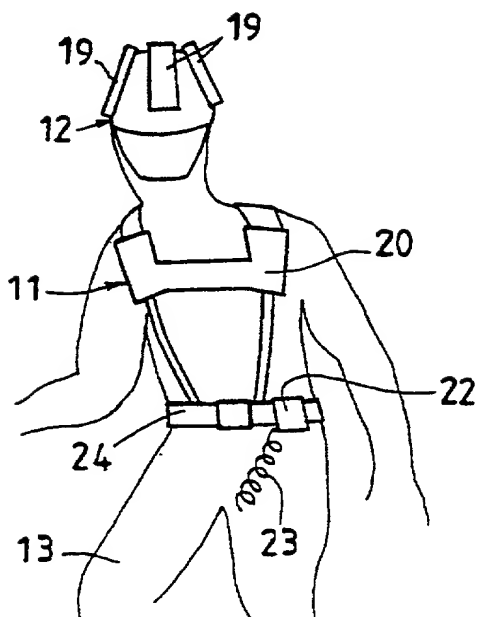
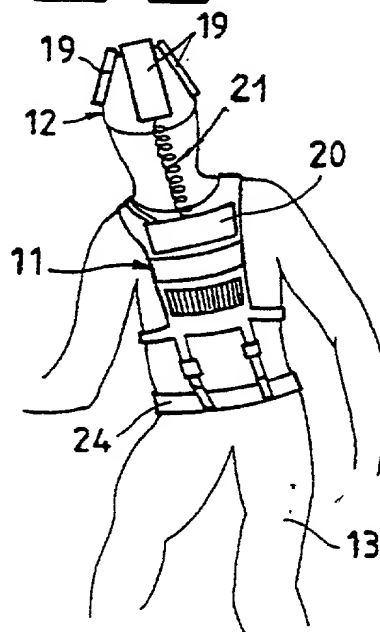
Fig.1Fig.2Fig.3

Fig.4

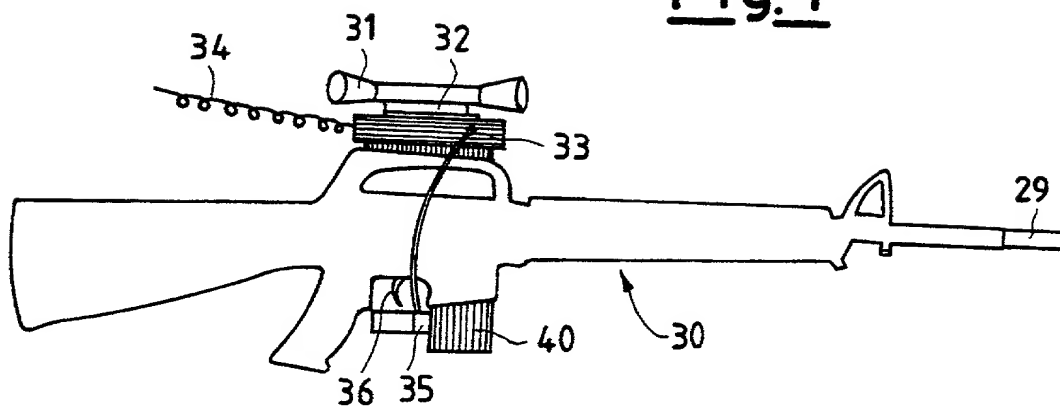


Fig.5

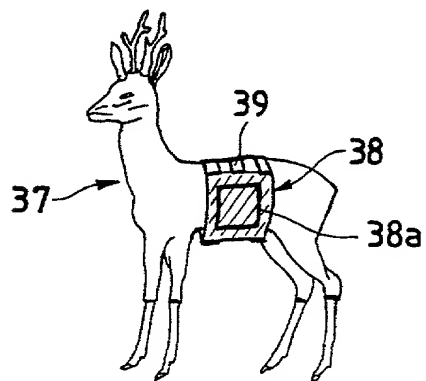


Fig.6

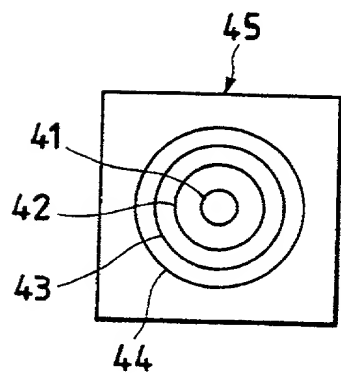
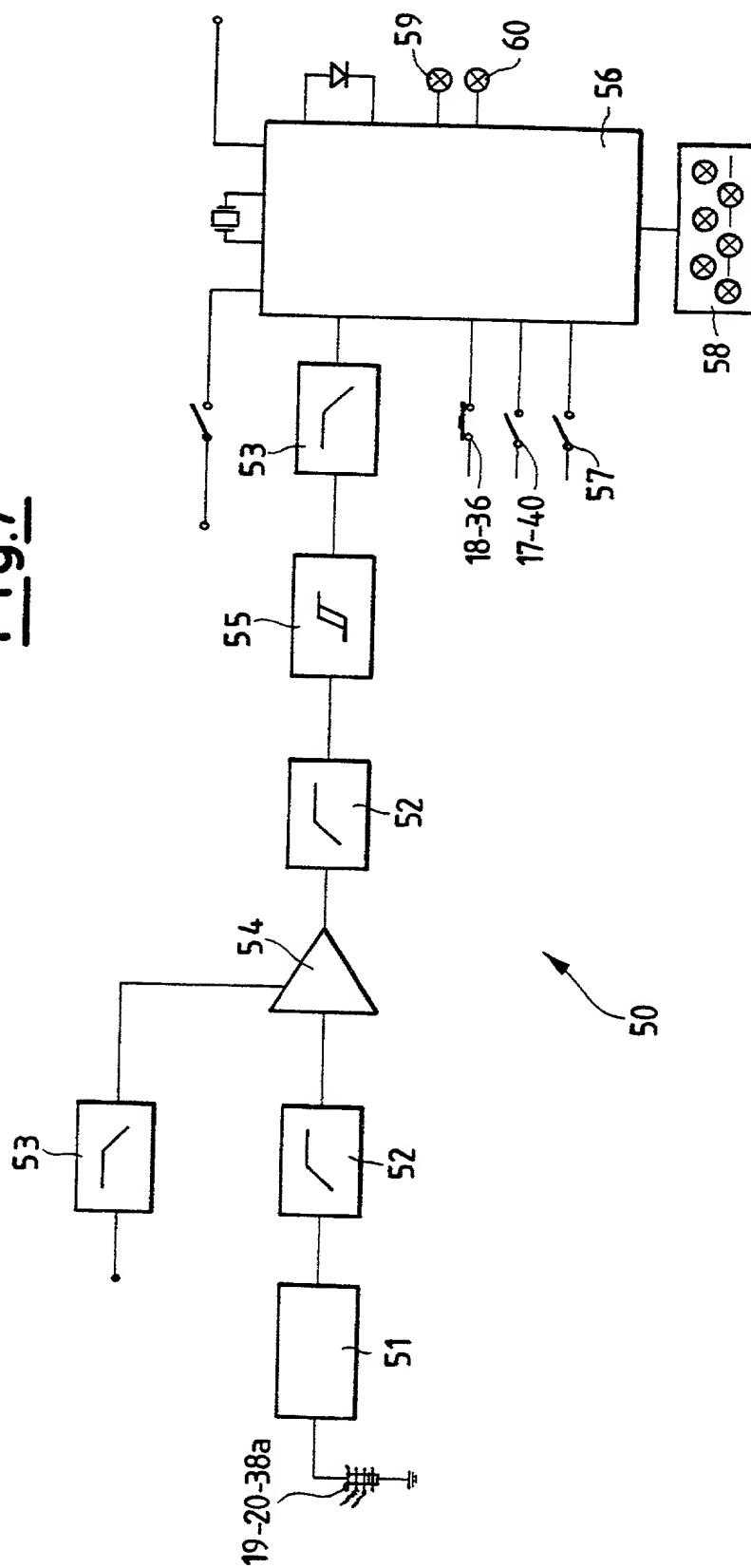


Fig. 7



Docket No: _____

APPLICATION FOR UNITED STATES LETTERS PATENT
DECLARATION, POWER OF ATTORNEY, AND PETITION

As a below-named inventor, I declare that:

My residence, post office address and citizenship are as stated next to my name; I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are named below) of the invention which is described and which is claimed in the specification, entitled: Equipment for detecting that a target has received a direct hit from a simulated weapon

The specification ☒ is attached hereto [] was filed on _____, as Application Serial No. _____.

I hereby state that I have reviewed and understand the contents of said specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.¹

COUNTRY	APPLICATION NUMBER	DATE (Day, Month, Year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
ITALY	MI99A000484	10 MARCH 1999	Yes <input checked="" type="checkbox"/> No []
			Yes [] No []

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

¹In Non-Convention cases, a listing of all filings and current status of cases filed more than a year before the U.S. filing is required to comply with 37 CFR 1.56(a). Such a listing may be attached.

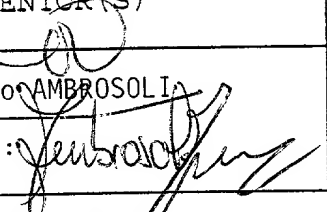
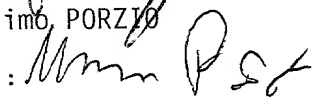
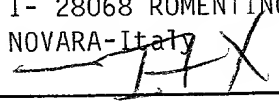
APPLICATION SERIAL NO.	FILING DATE	STATUS
PCT/EP00/02045	8 MARCH 2000	pending

I hereby appoint my attorneys with full power of substitution and revocation, to prosecute this application and to transact all business in the U.S. Patent & Trademark Office connected therewith:

Edward A. Hedman, Reg. No. 22,120; Thomas M. Gibson, Reg. No. 24,638; James V. Costigan, Reg. No. 25,669; Kenneth F. Florek, Reg. No. 33,173; Alan B. Clement, Reg. No. 34,563; Martin P. Endres, Reg. No. 35,498 and Timothy X. Gibson, Reg. No. 40,618.

CORRESPONDENCE AND CALLS TO: James V. Costigan, Esq.
HEDMAN, GIBSON & COSTIGAN, P.C.
1185 Avenue of the Americas
New York, NY 10036-2601
Telephone: (212) 302-8989

The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

INVENTOR(S)	DATE	RESIDENCE AND P.O. ADDRESS
Name: Franco AMBROSOLI Signature: 	Date: 22 AUGUST 2001 Citizen of: ITALY	Via Dolores Bello 5 I- 28100 NOVARA-Italy
Name: Massimo PORZIO Signature: 	Date: 22 AUGUST 2001 Citizen of: ITALY	Via Cavour 12 I- 28068 ROMENTINO NOVARA-Italy 
Name: Signature:	Date: Citizen of:	
Name: Signature:	Date: Citizen of:	